

course will be delivered in March and April, 1906, by Prof. H. A. Lorentz, professor of physics in the University of Leyden.

UNDER the title "The Education of the Examiner," Dr. Charles E. Fawsitt publishes, in the *Proceedings of the Royal Philosophical Society of Glasgow*, an interesting note on the statistics of examination marks as revealed by graphic methods. Most examiners who have had to draw curves showing the distribution of marks in any examination know the difficulty of obtaining an even uniform curve rising continuously to a maximum and then descending continuously. However carefully the scale of marking is adjusted, the curve has an unpleasant habit of showing two maxima, usually of unequal height, instead of the one maximum of the generally recognised standard curve. Dr. Fawsitt, as the result of observations on class examinations conducted at Edinburgh, brings forward the welcome suggestion that this irregularity is not the fault of the examiner, but is due to the fact that the candidates naturally divide themselves into two sets, namely, workers and non-workers, and that while the students in either set vary in every conceivable way in respect of ability, a marked line of division is drawn with regard to work. The superposition of two error curves, in accordance with this theory, gives results closely agreeing with those of common experience.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 16.—"On the Dimorphism of the English Species of Nummulites, and the Size of the Megalosphere in relation to that of the Microspheric and Megalospheric Tests in this Genus." By J. J. **Lister**, F.R.S.

The results obtained in this investigation are summarised as follows:—

(1) Both microspheric and megalospheric forms of *N. variolarius* and *N. Orbigny* var. *elegans* are present in the Eocene beds of the Isle of Wight and Hampshire, as the author believes they will be found to be present elsewhere, except when the materials of a bed have been re-arranged under the influence of currents.

(2) In these species and in *N. laevigatus* and *N. gizehensis* the size of the microsphere is nearly constant—the diameters in the specimens measured being between 15 μ and 20 μ .

(3) In the nine species and one variety of Nummulites which the author has examined, the size of the megalosphere is approximately proportional to the volume of the contents of the microspheric form.

By this result additional proof is given of de la Harpe's conclusion, founded on the mode of occurrence in the beds, and on structural features of the tests of the two forms, that these are in each case truly members of "a pair," or, as we now say, are related as alternating or recurring forms in the life-history of a species.

By (2) and (3) the two modes of reproduction come into marked contrast, the asexually produced megalospheres being proportional in size to the protoplasmic volume of the parent, while the microsphere, probably arising as a zygote, is uniformly small throughout.

(4) In several of the species examined, as the microspheric member of the cycle preponderates in the life-history, the megalospheric (or gamete-producing) member decreases, not only in proportion to the size of the microspheric form, but in proportion to the megalospheric members of other species in which the two forms attain approximately equal sizes.

April 6.—"Ovulation and Degeneration of Ova in the Rabbit." By Walter **Heape**. Communicated by Adam Sedgwick, F.R.S.

This paper is an abstract of several years' experimental work. The growth of the graafian vesicle and ovum, and the modification of the adjoining ovarian tissue, are referred to. The maturation of the ovum takes place in the ovary. It is dependent upon coition, and follows a cessation of

the supply of nutriment to the ovum. Ovulation occurs ten hours after copulation, and does not occur if coition is prevented.

The cause of the rupture of the graafian vesicle is probably due to the stimulation of ovarian contractile tissue, to effect which, in the domestic rabbit, the excitement of sexual contact appears to be necessary.

The prevention of coition results in the degeneration of ripe follicles, and the production of false corpora lutea. Such degenerate follicles do not rupture, and the ovum contained therein is not discharged. The structure and fate of the true and false corpora lutea are briefly described.

The persistent prevention of breeding causes degeneration of young as well as ripe follicles on a large scale, and results in more or less obstinate sterility.

Degeneration of young follicles occurs normally. While this may be due to want of nutriment, caused by competition of neighbouring follicles, it may also be due to incapacity to assimilate the nutriment which is supplied.

In this latter case, failure is due to a peculiarity in the constitution of the ovum, constituting it a "sport." As there is evidence that the production of variable offspring depends upon the quality or quantity of nutriment supplied to the mother, it is urged that the study of nutrition from this point of view becomes a matter of very great interest and importance to students of heredity.

A brief review of the evidence concerning the forces which influence breeding results in the conclusion that changes are induced in the constitution of the blood by means of a "generative ferment" of extraneous origin; the effect of which upon the generative glands causes their secretion of "gonadin," which exercises a profound effect upon the rest of the generative system.

"On the Nature of the Silver Reaction in Animal and Vegetable Tissues." By Prof. A. B. **Macallum**.

When fresh preparations of animal and vegetable tissues are treated with a solution of nitrate of silver containing free nitric acid and then exposed to light, they become coloured, the colour varying in intensity and tint. The author endeavoured to determine to what the reaction is due, and how far one may go in employing it for microchemical purposes. It was found that of the organic constituents of tissues, the only ones which form compounds with silver "reducible" under the action of light are sulphocyanic acid, creatin, and taurin. As creatin is present only in vertebrate muscle fibre, and not at all in invertebrates, while the other compounds mentioned occur in tissues only in infinitesimal, and, therefore, in negligible, quantities, the silver reaction cannot be attributed to their presence. It was further ascertained that neither phosphates, carbonates, nor sulphates give "reducible" silver compounds in the presence of free nitric acid. There remained, among organic compounds in tissues, only the proteids, and as these have been, and are, generally held to form, with silver salts, compounds which are "reduced" in light, it was necessary to determine whether the coloured compounds so formed are "albuminates" or simply the subchloride of silver. For this purpose proteids were freed from chlorides by repeated precipitation with pure ammonium sulphate, and it was found that egg and serum albumins and globulins, as well as the gelatins, after the eighth precipitation give no colour reaction whatever with nitrate of silver under the influence of light, and that the compounds eliminated by the precipitation, and to which the silver reaction is due, are chlorides. Nucleo-proteids also were found to be reactionless. In the case of vegetable proteids the methods employed were different, but the result was the same. Silver nitrate may, consequently, be used as a microchemical reagent for determining the presence of chlorides in animal and vegetable tissues, and its use for this purpose has already furnished some important results. Amongst these may be mentioned the absolute freedom of the nucleus from chlorides, the absence of the latter from the head of the spermatozoon, and the demonstration that they alone are the cause of the silver reaction in the "cement substance" (of von Recklinghausen) as well as in ordinary cell protoplasm.

May 18.—“Reciprocal Innervation of Antagonistic Muscles.” Eighth Note. By Prof. C. S. **Sherrington**, F.R.S.

Exhibition of strychnine converts reflex inhibition of muscles into excitation; so also, more gradually, but just as potently, does *tetanus-toxin*. This conversion sets in before and under smaller doses of strychnine or toxin than are required to produce the convulsive seizures characteristic of strychnine poisoning or general tetanus.

The conversion of inhibitory effect into excitation effect by strychnine is more easily obtained in the case of some nerves than of others.

The conversion of spinal inhibition into excitation by strychnine explains the simultaneous contraction of large inharmonious groups of muscles in strychnine convulsions. It also explains the occurrence, under a given stimulus of reflex contraction, of muscles that previously do not seem, under superficial examination, to be reached by the reaction. These muscles are really included in the reflex effect normally, but the effect on them then being *inhibition*, it passes unnoticed, unless special means are adopted for seeing it. Thus, in the ordinary “flexion reflex,” initiated, say, from the right foot, the flexion of the homonymous knee is easily seen to be due to contraction of its flexor muscles, also the concomitant extension of the crossed knee is easily seen to be due to contraction of its extensor muscles. But it requires special preparations to detect that, with the contraction of the right knee-flexors, there goes reflex inhibition of the right extensor, and that, with the contraction of the left knee-extensors, there goes reflex inhibition of the left knee-flexors. This being so, when under strychnine, the reflex is suddenly changed in character, both flexors and extensors being in both legs thrown into contraction together, it appears to an observer, unaware of the previous inhibitions, that, under the strychnine, the reflex action reached muscles which it did not reach before, *e.g.* right knee-extensor and left knee-flexor. Hence arises the hypothesis that the alkaloid breaks down a supposed spinal “resistance,” previously intervening between the afferent nerves and various motor spinal cells ordinarily inaccessible to them. Strychnine does lower the threshold stimulus for spinal reflexes at one stage of its action; but the central fact of strychnine effect appears to the author that it destroys spinal taxis for the skeletal musculature by upsetting the fundamental coordination of reciprocal innervation. It upsets reciprocal innervation because it transforms inhibition into excitation.

On the view advanced in these notes previously that the cortex of the brain exercises reciprocal innervation of antagonistic muscles, strychnine and tetanus-toxin should transform the functional topography of the “motor” cortex. This on examination proves to be the case.

Strychnine and tetanus-toxin change cortical flexion of leg and arm into extension. Reflex “opening” of the jaw is in the decerebrate animal converted into reflex closure by tetanus-toxin and by strychnine, the inhibition of the predominantly powerful closing muscles being converted into excitation of them.

Similarly, when the “face-area” of the monkey’s cortex is tested by faradisation after exhibition of strychnine or tetanus-toxin, the points of surface that, prior to the drug, yield regularly the free opening of the jaw, yield strong closure of the jaw instead. Closure of the jaw is, comparatively, an infrequent movement to obtain from the cortex of the monkey. On the other hand, *opening* of the jaw is always readily and regularly elicitable from a large field of the “face-area.” Under tetanus toxin and strychnine the whole of this area not only ceases to yield opening of the jaws, either maintained or rhythmic, but yields closing of them instead.

The foregoing observations give an insight into the essential nature of the condition brought about by tetanus and by strychnine poisoning. These disorders work havoc with the coordinating mechanisms of the central nervous system, because, in regard to certain great groups of musculature, they change the reciprocal inhibitions, normally assured by the central nervous mechanisms, into excitations. The sufferer is subjected to a disorder of coordination which, though not necessarily of itself accom-

panied by physical pain, inflicts on the mind, which still remains clear, a torture inexpressibly distressing. Each attempt to execute certain muscular acts of vital importance, such as the taking of food, is defeated because exactly the opposite act to that intended results from the attempt. The endeavour to open the jaw to take food or drink induces closure of the jaw, because the normal inhibition of the stronger set of muscles—the closing muscles—is by the agent converted into excitation of them. Moreover, the various reflex arcs that cause inhibition of these muscles not only cause excitation of them instead, but are, periodically or more or less constantly, in a state of hyper-excitement, and yet attempt on the part of the sufferer to restrain, to inhibit, their reflex reaction, instead of relaxing them, only heightens their excitation further, and thus exacerbates a rigidity or a convulsion already in progress.

“The Structure and Function of Nerve Fibres.—Preliminary Communication.” By Prof. J. S. **Macdonald**. Communicated by Prof. C. S. Sherrington, F.R.S.

In contradiction to certain conclusions¹ arrived at by the author as a consequence of his experimental observation of the “injury current” of nerve, it has recently been denied² that inorganic salts occur in any appreciable quantity within the internal structure of the nerve-fibre. This conclusion has been formed as the result of observations made with the use of a reagent—cobalt nitrite—which precipitates potassium salts in a manner open to investigation with the microscope. It has been shown that the reagent does not give rise to precipitates at every point in the length of the nerve-fibre, but only at certain points of infrequent occurrence. The author has checked this statement, also using microscopical methods, and confirms it. He draws, however, an entirely different conclusion from these observations, since he has further observed that these points of infrequent occurrence are points at which the axis-cylinder has been injured in the course of preparation. He concludes that potassium salts are really present in very considerable quantity uniformly distributed along the axis-cylinder, but that they appear in a state of simple solution only at injured points.

The author directs attention to the possible general importance acquired by this observation, when account is taken of the parallelism between injury and “excitation.” The sudden appearance of inorganic salts (electrolytes) in a state of simple aqueous solution at an excited point means a transitory increase in local osmotic pressure, new processes of diffusion, and disturbances of electrical potential. In this he sees a sufficient explanation of nerve-conduction. In the case of muscle, also, the influence of similar phenomena is considered, and a possible relation between such an increase in local osmotic pressure and “contraction.” He also refers to the possibility of the influence of this factor in the conditions determining the flow of water in plant structures.

June 8.—“The Perturbations of the Bielid Meteors.” By Dr. A. M. W. **Downing**, F.R.S.

As the general result of the calculations described in this paper, it appears that the most probable date for the centre of a shower of Bielid meteors this year is November 18, 10h., G.M.T. If there be a shower at that date, it will indicate that the meteor stream is, in this part, of sufficient length to occupy at least thirty-three days (October 16 to November 18) in passing a definite point in its orbit—or that there is another swarm following the main swarm at this interval—and is also of sufficient extent in the direction sun-earth to allow of some of the meteors encountering the earth, although the centre of the stream is more than 1,000,000 miles outside the earth’s orbit at the time.

“Chitin in the Carapace of *Pterygotus osiliensis*, from the Silurian of Oesel.” By Dr. Otto **Rosenheim**. Communicated by Prof. W. D. Halliburton, F.R.S.

Fragments of the carapace of certain fossil Eurypterids found in Oesel in rocks of Silurian age, from specimens

¹ J. S. Macdonald, “Thompson-Yates Laboratory Reports,” vol. iv., part ii., pp. 213–348, 1902; *Proc. Roy. Soc.*, vol. lxxv., pp. 315–324; *ibid.*, pp. 325–328; *Proc. Physiol. Soc.*, December 17, 1904; *ibid.*, March 18, 1905.

² A. B. Macallum, *Journal of Physiology*, vol. xxxii. p. 1.

in the British Museum (Natural History), have been examined by the author for chitin.

The conclusion drawn from the experiments is that the general behaviour of the substance towards acids and solvents is such that it is probably chitin, and this is confirmed by the fact that, after such treatment, it yielded, on hydrolysis with concentrated hydrochloric acid, a strongly reducing substance which is presumably glucosamine.

"On the Magnetic Qualities of some Alloys not Containing Iron." By Prof. J. A. **Fleming**, F.R.S., and R. A. **Hadfield**.

For the purposes of exact magnetic measurements two homogeneous rings of regular form of alloys not containing iron were made at the Hadfield Steel Works, Sheffield, and sent to the Pender Electric Laboratory of University College, London. These two rings were respectively numbered No. 1871 and No. 1888/7. The ring No. 1871 had the following composition:—manganese, 22.42 per cent.; copper, 60.49 per cent.; aluminium, 11.65 per cent. There is a certain amount of intermingled slag, probably 2 per cent. or 3 per cent., mostly consisting of MnO and SiO₂, and slight traces of other metals. Analysis showed that there was present also:—carbon, 1.5 per cent.; silicon, 0.37 per cent.; and iron, 0.21 per cent. Hence it may be said that nothing but a trace of iron occurs in this sample of alloy. The other ring, No. 1888/7, had an approximate composition:—manganese, 18 per cent.; copper, 68 per cent.; aluminium, 10 per cent.; lead, 4 per cent. These alloys unfortunately have poor mechanical properties and are brittle and cannot be forged. Rings were cast from the material and turned in the lathe to the desired form.

From the observations the following conclusions are drawn:—

(1) The alloy No. 1871, composed of copper, aluminium, and manganese in the proportion mentioned above, exhibits magnetic properties which are identical with those of a feebly ferro-magnetic material. (2) The magnetisation (or B, H) curve is of the same general form as that of a ferro-magnetic metal such as cast iron, and indicates that with a sufficient force, a state of magnetic saturation would most probably be attained. (3) The alloy exhibits the phenomenon of magnetic hysteresis. It requires work to reverse the magnetisation of the material and to carry it through a magnetic cycle. (4) The material has a maximum permeability of 28 to 30, which is not greatly inferior to that of the values reached for cobalt or a low grade of cast iron for small magnetic forces, and occupies a position intermediate between the permeability of the ferro-magnetic and the merely para-magnetic bodies, such as liquid oxygen and ferric chloride. (5) The material exhibits, therefore, the phenomenon of magnetic retentivity and coercivity. It is not merely magnetic, but can be permanently magnetised.

The authors are led by these results to conclude that the magnetic properties of this alloy must be based on a certain similarity of molecular structure with the familiar ferro-magnetic metals.

Experiments on the magnetic qualities of the alloy No. 1888/7 give results similar to those of the alloy No. 1871. For both alloys No. 1871 and No. 1888/7 the hysteresis exponents are not very different, being respectively 2.238 and 2.288, whereas the hysteresis constants are very different, being respectively 0.0005495 and 0.000776. It is clear, therefore, that both these alloys, although magnetic, have far greater hysteresis than pure iron, nickel, or cobalt for corresponding cycles of magnetisation.

"Note Supplementary to a Paper 'On the Radio-active Minerals.'" By the Hon. R. J. **Strutt**, F.R.S.

In a paper read before the society on February 28, the author directed attention to the fact that all thorium minerals, so far as could be ascertained, appeared to contain uranium and radium. Since then he has examined a number of additional minerals, in order to test the induction further. The result has been quite confirmatory of the original conclusion. The author, in this further investigation, contented himself with determining the thorium and radium, for it may now be considered proved

that radium is a product of uranium, and it is much easier to establish the presence of radium by its emanation than to detect uranium by chemical analysis. The experimental methods explained in the former paper were employed. The results are as follows:—

Mineral	Locality	Thorium oxide, per cent.	Radium, millionths of 1 per cent.
Thorite ...	Ceylon	61.0	1.00
" ...	Brevig, Sweden ...	53.9	0.81
Monazite ...	Johannesberg	5.94	1.06
Alvite ...	Raade Moss, Norway	4.95	1.81
Xenotime ...	"	3.89	0.90
Monazite ...	N. Carolina ¹	3.79	0.53
" ...	Nigeria	2.98	3.78
Anerodite? ...	Ceylon	2.27	9.80
Monazite ...	Malay Straits	1.53	4.02
Fergusonite	?	1.31	26.7
Malacane ...	Hitteroe, Norway ...	1.15	1.40
Allanite ...	Amherst Co., Virginia	0.492	1.08
Yttrotantalite	Ytterby, Sweden ...	0.437	5.56
Polycrase ...	?	0.334	0.36
Zircon ...	N. Carolina	0.307	0.34
" ...	Virginia	0.217	0.52

¹ This consisted of pure grains of monazite, picked out from the commercial sand.

Mathematical Society, June 8.—Prof. A. R. Forsyth, president, and temporarily Prof. W. Burnside, vice-president, in the chair.—On the conditions of reducibility of any group of linear substitutions, and On criteria for the finiteness of the order of a group of linear substitutions: Prof. W. **Burnside**. In the first of these papers it is proved that a group of linear substitutions on a finite number of symbols is reducible if, and not unless, one or more linear equations holds between the coefficients of every substitution of the group. In the second paper it is shown that in order that a group of linear substitutions may be of finite order it is necessary that both the real part and the imaginary part of every coefficient should lie between two fixed assignable numbers, and this condition is sufficient.—On a class of many-valued functions defined by a definite integral: G. H. **Hardy**. The integral

$$\int_0^{\infty} \frac{e^{-u} u^{a-1}}{u+x} du$$

is a many-valued function of x having no singularities save $x=0$, and the behaviour of the function depends on the character of a and λ as rational, algebraic or transcendental numbers. In a number of cases the function can be represented in the neighbourhood of the singular point by a convergent combination of two divergent power series.—Informal communications were made as follows:—The first principles of Cauchy's theory of functions: G. H. **Hardy**.—On differential equations whose integrals are expressible by partial quadratures: Prof. A. R. **Forsyth**.

Royal Astronomical Society, June 9.—Mr. W. H. Maw, president, in the chair.—The discordant values of the principal elliptic coefficients in the moon's longitude: P. H. **Cowell**.—Determination of heat radiation from the moon: the **Earl of Rosse**. The author had found that the lunar heat varied with the phase, that it was negligible at new moon, and attained its maximum at full moon. He considered it a surface heat, not regularly reflected, but absorbed and re-emitted. Suggestions were made for future observations during lunar eclipses. Prof. Turner stated that the maximum at full moon might indicate that some of the heat was reflected.—The diurnal variations of nadir and level of the Greenwich transit circle: **Astronomer Royal**. The variation of the level has a period of twenty-four hours, with a maximum about 6 a.m.

and a minimum about 6 p.m. The variations of nadir are much smaller, and do not show any conclusive result except a discordance near 6 p.m.—On the determination of stellar proper motions without reference to meridian places: A. R. **Hinks**.—The meteors from Biela's comet: W. F. **Denning** and Dr. **Downing**.—General scheme for determinations of stellar parallax from photographs taken at the Cambridge Observatory: A. R. **Hinks** and Dr. H. N. **Russell**. A brief account was also given of results already obtained for the parallax of Lalande 21185 and γ Virginis.

Zoological Society, June 6.—Dr. Henry Woodward, F.R.S., vice-president, in the chair.—Specimen of a new bushbuck, which it is proposed to call *Tragelaphus haywoodi*, sp. n.: O. **Thomas**. Mr. Thomas also exhibited some mammals and birds from Japan obtained by a collector sent out by the society's president, the Duke of Bedford, K.G., who proposed to further zoological science by having systematic collections made in that part of the world. Of the present series Mr. Thomas directed attention to a fine marten, different from the true *Mustela melampus*, and which he proposed to call *Mustela melampus bedfordi*, subsp. n.—On the intestinal tract of mammals: Dr. P. C. **Mitchell**. In the course of the last eight years, the author had taken every possible opportunity of studying the alimentary tract of mammals from specimens that had died in the society's gardens, and had obtained additional material elsewhere, with the result that his investigations covered more than two hundred individuals, and included the greater number of the mammalian orders.—The natural history of western Uganda, deduced from observations and collections made by the author while acting as British Boundary Commissioner on the Uganda frontiers: Lieut.-Colonel C. **Delmé-Radcliffe**.—Distribution of Mexican Amphibia and Reptilia: Dr. H. **Gadow**. After a critical revision of the species recorded from Mexico, the author stated that he grouped them according to the prevailing physical features of the country. It was found that Mexico had received its present fauna from both the northern and the southern continents. The northern immigrants had spread over high tablelands and mountains, whilst not a few species had descended into the hot lowlands, even into Central America and still further south. On the other hand, the southerners were divided by the plateau into an Atlantic and a Pacific mass, each having had time to modify many of its members according to the very different physical features. Scarcely any of these southerners had ascended the plateau, but they were not averse to ascending high outlying mountains. A comparative list of species confined to high altitudes was given, and the conclusion arrived at, with the help of geological data and the fauna of the Antilles, was that the exchange between the north and south took place during the Miocene epoch, at which period alone the Antilles were connected with Central America.—New species of reptiles discovered in Mexico by Dr. H. Gadow: G. A. **Boulenger**.—Batrachians and reptiles collected in South Africa by Mr. C. H. B. Grant and presented to the British Museum by Mr. C. D. Rudd: G. A. **Boulenger**.—Notes on the anatomy of the yellow-throated lizard, *Gerrhosaurus flavigularis*: F. E. **Beddard**.—Notes on the cerebellum in the exanthematic monitor, *Varanus exanthematicus*, and on the cerebral hemispheres in the Taraguira lizard, *Tropidurus hispidus*: F. E. **Beddard**.—The fœtus and placenta of the spiny mouse, *Acomys cahirinus*: R. **Assheton**.—Some new Coleoptera from South Africa: Rev. H. S. **Gorham**. The beetles referred to were of the families Malacodermata, Cleridæ, and Erotylidæ, and had been collected by Dr. H. Brauns, of Willowmore, in Cape Colony, either at Willowmore or at Delagoa Bay in 1900 or 1901, and indicated that the fauna of South Africa was rich in species of the two first families, and more so than had been supposed in members of the latter family. One new genus was described.—Remarks on the supposed clavicle of the sauropodous dinosaur *Diplodocus*: Baron Francis **Nopcsa**.

EDINBURGH.

Royal Society, June 5.—Prof. Geikie in the chair.—The distribution of the nerve cells in the intermediolateral tract of the dorso-lumbar region of the human spinal cord: Dr.

A. **Bruce**. The region was found to extend from the end of the upper third of the eighth cervical to the lower extremity of the second or, perhaps, the upper part of the third lumbar segment, and to occur, not as a continuous tract, but as clusters or groups of cells, separated in some of the upper and lower segments by distinct intervals in which there were no cells, but in the greater part of the dorsal region by incomplete intervals in which there were present a small number of cells. The clusters appeared to be arranged in a manner characteristic more or less of each segment, attaining their maximum number in the third dorsal. The cells lay in the white matter behind the lateral portion of the anterior cornua in the eighth cervical and first dorsal segments; below that point they occupied the apex of the lateral horn, and from the lower part of the second dorsal region they occupied also the grey matter subjacent to the formatio reticularis, and occasionally extending into the formatio reticularis itself. The clusters of cells in this, the reticular group, were frequently continuous with those at the apex of the horn, and belonged undoubtedly to the same system. It was found that the symmetry between the two sides of the cord was not quite complete.—The Tardigrada of the Scottish lochs: J. **Murray**. Twenty-one species were identified, of which six were considered new. It has been usual to distinguish species of Echiniscus by the number and arrangement of the spines and other processes, but in some of the species it was found that spines continue to increase in size at the moult, and that new ones may appear. Also one or two species lay eggs when hardly larger than larvæ, and at successive moults thereafter lay more and larger eggs. In the study of the order there is, in fact, great need for careful tracing of life-histories.—Report on the Medusæ found in the Firth of Clyde (1901-2), and notes on the pelagic fauna: E. T. **Brown**. The report deals with thirty species of Hydromedusæ and five species of Scyphomedusæ, most of which had not previously been found in the Clyde. The fauna is distinctly littoral. Important information as to the seasonal changes in the fauna was obtained. Medusæ are very scarce in winter, and begin to appear about the middle of March. Most of the forms appear during summer, and begin to die off in September and October. The notes on the pelagic fauna contain an account of a number of miscellaneous animals found in the tow-net at different times of year.—Report on the free-swimming Crustacea found in the Firth of Clyde (1901-2): Dr. T. **Scott**. The summer months were the best and richest for plankton in the Clyde, a characteristic feature of the summer being the vast quantities of diatoms. During the winter months the plankton consists almost entirely of five species of copepods.—On a new method of preparing esters: Dr. W. W. **Taylor**. The water formed by the interaction of the acid and alcohol was removed by the addition of benzene, and distillation of the ternary mixture of alcohol, benzene, and water.—Vanishing aggregates of determinant minors: Prof. W. H. **Metzler**.

PARIS.

Academy of Sciences, June 13.—M. Troost in the chair.—The action of fluorine on the oxygen compounds of nitrogen: Henri **Moissan** and Paul **Lebeau** (see p. 183).—The moving shadows of the total eclipse of the sun of May 12, 1706: G. **Rayet**. Reference to some remarks of De Joly concerning the phenomena of moving shadows observed by him during the total eclipse of the sun, May, 1706.—On a solution of Monge's problem relating to the equation $f(dx_1, dx_2, \dots, dx_n) = 0$ with variable coefficients: M. **Bottasso**.—The measurement of the capacity of long submarine cables: M. **Devaux-Charbonnel**. The principle of the method consists of charging the cable and a condenser of known capacity placed in cascade, the capacity of the cable being deduced from the charge taken up by the condenser. The method has several advantages over those in current use, and has been applied with success to the cable recently laid between Brest and Dakar.—Thermoelectric power and the Thomson effect: M. **Ponsot**.—Pyrrhotine, ferromagnetic in the magnetic plane and paramagnetic perpendicularly to that plane: Pierre **Weiss**. The atomic susceptibility of iron in pyrrhotine, measured perpendicularly to the magnetic plane, is very near the atomic susceptibility of iron in paramagnetic bodies.—On the true atomic weight of

nitrogen: G. D. **Hinrichs**. The author gives his reasons for supposing that the atomic weights of the elements can be more accurately determined by calculation than by experiment.—On a mode of formation of acetol by the direct oxidation of acetone: M. **Pastureau**. By the oxidation of acetone in acid solution by hydrogen peroxide, the author shows that in addition to the peroxide already described by Baeyer and Villiger, acetol and pyruvic acid are always formed, the yield of the latter amounting to 75 per cent. of the weight of acetone taken. The application of the reaction to higher ketones would appear to show that in addition to the ketone peroxide, the keto-alcohols and ketonic acids are always formed.—The action of sodium on the esters of the fatty acids: M. **Bouveault** and R. **Locquin**. By the action of sodium on a cooled ethereal solution of ethyl butyrate, the principal product is the keto-alcohol $C_3H_7-CO-CH(OH)-C_3H_7$, a small quantity of dibutyl also being obtained.—On some aromatic substitution derivatives of ethylene oxide: MM. **Fourneau** and **Tiffeneau**. The substituted ethylene $R-CH=CH_2$ is treated with iodine and yellow mercuric oxide, and the iodohydrin thus obtained digested with powdered caustic potash. Details are given of the preparation and properties of phenyl, benzyl, methoxyphenyl, and methylphenyl ethylene oxide.—The action of chloroacetic esters on the halogen magnesium derivatives of aniline: F. **Bodroux**.—On some compounds of azelaic acid: A. **Bouchonnet**. The preparation of the phenyl ester and of thioazelaic acid is described.—On sparteine and its reaction with methyl iodide: Charles **Moureu** and Amand **Valeur**. The authors have isolated from this reaction, besides the iodomethylate already known, an isomer, probably a stereoisomer, distinguished by its higher rotatory power and its solubility in water.—On the pyrolysis of gum lac: A. **Etard** and E. **Wallée**.—On the affinity of artificial colouring matters for conjunctive tissue: M. **Curtis** and P. **Lemoult**. A study of the various stains in use in histological work from the point of view of their permanence.—On the reserve carbohydrates in evergreens: Leclerc **du Sablon**.—On a new banana tree of Madagascar: Pascal **Ciaverie**. The species described appears to be new, and is named by the author *Musa Perrieri*.—On *Oidium lactis* and the ripening of cream and cheese: P. **Mazé**. Remarks on a paper on the same subject by M. Arthaud-Berthet.—The ancient coastal lines of the Sahel d'Alger: General **de Lamothe**.—On glaukrite, a new rock in dunite: L. **Duparc** and F. **Pearce**. Veins of the new mineral are found in the dunite mass on the river Wagran in the N. Ural. It is a silicate of iron, alumina, lime, magnesia, soda, and potash.—On the probable yield of the springs in the basin of the Seine during the second quarter of 1905: F. **Launay** and E. **Maillet**.

NEW SOUTH WALES.

Linnean Society, April 26.—Mr. T. Steel, president, in the chair.—Revisional notes on Australian Carabidae, part ii., tribe vi., Scaritini: T. G. **Sloane**. Critical observations and tabular lists are offered, and six species are described as new.—The possible relationship between bacteria and the gum of *Hakea saligna*: Dr. R. Greig **Smith**. The conclusions to which this research has led are as follow:—(1) The gum of *Hakea saligna* is neither arabin, metarabin, nor pararabin. The hydrolytic products consist of reducing bodies that yield indefinite osazones, and are probably akin to the furfuroids of Cross, Bevan, and Smith. It is not pectin, although it approaches this substance in some respects. (2) Of the bacteria occurring in the tissues of the plant, the most probable producer of the gum is one intermediate between *Bact. acaciae* and its variety *Bact. metarabinum*, but as we do not yet know that the host plant can alter a gum once formed by a bacterium, it cannot be said that the gum is produced by this micro-organism.—The origin of natural immunity towards the putrefactive bacteria: Dr. R. Greig **Smith**. The author shows:—(1) That there is a close analogy or identity between the production of bacteriolytic bodies and the digestion of food. (2) That bacteria do traverse the intestinal wall, and that negative experimental results regarding the same are untrustworthy. (3) That natural immunity, especially towards the bacteria that

normally inhabit the intestinal tract, is occasioned and maintained by the comparatively few bacteria which, in crossing the intestinal wall and possibly gaining access to the body fluids and organs, stimulate the cells to produce immune bodies. (4) That the agglutination of bacteria may claim a much more active part in the production of immunity than is generally supposed.—The probable bacterial origin of the gum of linseed mucilage: Dr. R. Greig **Smith**. Following is a summary of the research:—(1) The gums of linseed mucilages vary in their chemical reactions, and, therefore, probably vary in their chemical constitution. (2) The products of hydrolysis consist of galactose and reducing substances which yield indefinite osazones that are possibly akin to the furfuroids of Cross, Bevan, and Smith. (3) The gum bacteria in the tissues of *Linum* are relatively very numerous, and consist chiefly of races of two species. (4) The chemical reactions of the gums from these are practically identical with the reactions of average linseed gum. (5) The gum of one of the bacteria is hydrolysed to galactose, and of the other to galactose and a reducing substance that yields an indefinite osazone. Both gums contain a large proportion of the furfuroid substances. (6) The gum formed by bacteria is probably altered by the plant into mucilage and other substances required in the plant economy. (7) A number of so-called species of gum bacteria have probably one common origin; the host plant can alter the nature of the gum product which influences the growth characters.

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